

Box 2–4

Wildlife and Zoonoses: Different Roles for Different Diseases



Wildlife may contribute to zoonoses in ways other than direct transmission between wildlife and humans. For influenza, the greatest wildlife contribution is the transfer of genetic material between influenza viruses that leads to disease emergence in humans, not direct contact between humans and wildlife. For some diseases, such as Lyme disease and ehrlichiosis, the major role for wildlife is disease maintenance in nature; for other diseases such as giardiasis, the primary role is environmental contamination by wildlife (e.g., shedding infectious agents into surface waters) leading to human infections. Birds infected with West Nile virus serve as a source for infection of mosquitoes that then infect humans, and the disease spreads through the movements of infected birds. The following examples highlight some of the major roles wildlife have in the ecology of zoonoses, besides direct contact transmission of the disease.

Tick Production

Lyme disease is typically contracted from the bite of infected ticks and not from contact with wildlife that may harbor the causative spirochete bacterium. Tick populations are dependent upon having adequate numbers of hosts to feed on as their growth and reproduction requires blood meals to provide the necessary nourishment. Typically, when larvae emerge from the egg, they feed on small rodents, such as mice; nymphs and adults feed on larger mammals. Thus, mice and white-tailed deer are the species that contribute to the maintenance of tick populations, and through that contribution, to the transmission of Lyme disease.



Photo by Milton Friend

Gene Pool Contributions

Migratory birds, especially shorebirds, are an important source of influenza viruses but rarely suffer clinical illness or mortality from those viruses. However, recombination is a characteristic of influenza viruses, and involves the transfer of genetic material between different influenza viruses to produce new virus strains. These exchanges involve mammals, especially swine, as well as birds and



Photo by Milton Friend

are the source of virus variants that are lethal for poultry and other variants that cause disease in humans.

Developmental Hosts

Many metazoan parasites require one or more wildlife hosts for the parasite to become pathogenic for humans. For example, wildlife species such as red foxes and coyotes are definitive hosts for the tapeworm *Echinococcus multilocularis*, the cause of hydatid disease; they are essential components of the disease cycle. Infected wild carnivores imported into areas where this parasite is not yet established pose a significant threat to human health by introducing the parasite into the wildlife populations of the new area.



Photo by Milton Friend



Photo by Elizabeth Cigenovich

Environmental Contamination

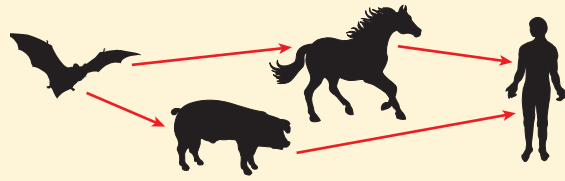
Giardiasis is a common waterborne disease of humans. Cysts of the protozoan parasite that cause this disease are shed in the feces of infected animals, such as beaver, and are immediately infective. Surface waters become contaminated in this manner and unless adequately treated, become a source for human infections.

Amplification Hosts

The ability of arthropods to become infected (biological transmission) or for their mouth parts and excretions to be contaminated at levels sufficient for mechanical disease transmission is a function of the number of organisms present in the blood meal taken by the arthropod. The rapid spread of West Nile fever in North America has been facilitated by the high level of viremia in infected crows and some other bird species. Mosquitoes feeding on these birds become infected and continue the transmission cycle when they take their next blood meal from another susceptible host.



USGS file photo



Interspecies Transfers

Wildlife often harbor microbes and parasites that are not pathogens for them, but become disease agents for other species that interface with those wildlife or environments contaminated by them. Human infections occur as a result of contact with other species, not with the wildlife host. Among numerous examples are the recent emergence of Nipah and Hendra virus infections. Both involve domestic animals as the source of human infections and fruit bats as the wildlife reservoir hosts.⁴⁸



Photo by Milton Friend

Spread of Infection

The movement patterns of wild birds have long been associated with the spread of infectious disease, including zoonoses.^{362–367} Arthropod vectors often are “hitchhikers” that transfer to new environments and geographic areas during bird and other wildlife movements. These arthropods may provide means for transmission of indigenous pathogens or they may be infected with diseases new for the environments they enter. Infected wildlife also may serve as a source for infection of local arthropod populations as occurs for mosquitoes and West Nile fever. Earlier studies have suggested that infected migrating birds are the source for repeated West Nile virus (WNV) introductions in the central highlands of South Africa. Also, experimental studies and isolations from nature indicate that WNV can adapt to ticks and may be transferred by tick bite.³⁶³